

# FGA50N100BNTD2

## 1000V, 50A NPT-Trench IGBT CO-PAK

### Features

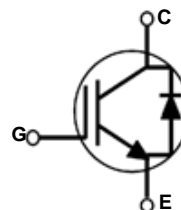
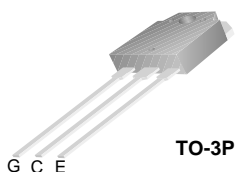
- High Speed Switching
- Low Saturation Voltage :  $V_{CE(sat)} = 2.5\text{ V @ } I_C = 60\text{ A}$
- High Input Impedance
- Built-in Fast Recovery Diode
- RoHS Compliant

### Applications

Micro-Wave Oven, I-H Cooker, I-H Jar, Induction Heater, Home Appliance.

### General Description

Trench insulated gate bipolar transistors (IGBTs) with NPT technology show outstanding performance in conduction and switching characteristics as well as enhanced avalanche ruggedness. These devices are well suited for micro-wave, Induction heating (I-H) Jar, induction heater, home appliance.



### Absolute Maximum Ratings

Symbol	Description	Ratings	Units
$V_{CES}$	Collector to Emitter Voltage	1000	V
$V_{GES}$	Gate to Emitter Voltage	$\pm 25$	V
$I_C$	Collector Current @ $T_C = 25^\circ\text{C}$	50	A
	Collector Current @ $T_C = 100^\circ\text{C}$	35	A
$I_{CM(1)}$	Pulsed Collector Current	200	A
$I_F$	Diode Continuous Forward Current @ $T_C = 100^\circ\text{C}$	15	A
$I_{FM}$	Diode Maximum Forward Current	150	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	156	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	63	W
$T_J$	Operating Junction Temperature	-55 to +150	$^\circ\text{C}$
$T_{stg}$	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
$T_L$	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

**Notes:**

1: Repetitive rating : Pulse width limited by max. junction temperature

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}(\text{IGBT})$	Thermal Resistance, Junction to Case	-	0.8	$^\circ\text{C/W}$
$R_{\theta JC}(\text{DIODE})$	Thermal Resistance, Junction to Case	-	1.2	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	-	40.0	$^\circ\text{C/W}$

### Package Marking and Ordering Information

Device Marking	Device	Package	Packaging Type	Qty per Tube	Max Qty per Box
FGA50N100BNTD2	FGA50N100BNTD2	TO-3PN	Rail / Tube	30ea	-

### Electrical Characteristics of the IGBT T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
<b>Off Characteristics</b>						
BV <sub>CES</sub>	Collector to Emitter Breakdown Voltage	V <sub>GE</sub> = 0V, I <sub>C</sub> = 1mA	1000	-	-	V
I <sub>CES</sub>	Collector Cut-Off Current	V <sub>CE</sub> = 1000V, V <sub>GE</sub> = 0V	-	-	1.0	mA
I <sub>GES</sub>	G-E Leakage Current	V <sub>GE</sub> = ±25V, V <sub>CE</sub> = 0V	-	-	±500	nA
<b>On Characteristics</b>						
V <sub>GE(th)</sub>	G-E Threshold Voltage	I <sub>C</sub> = 60mA, V <sub>CE</sub> = V <sub>GE</sub>	4.0	5.5	7.0	V
V <sub>CE(sat)</sub>	Collector to Emitter Saturation Voltage	I <sub>C</sub> = 10A, V <sub>GE</sub> = 15V	-	1.5	1.8	V
		I <sub>C</sub> = 60A, V <sub>GE</sub> = 15V	-	2.5	2.9	V
		I <sub>C</sub> = 60A, V <sub>GE</sub> = 15V, T <sub>C</sub> = 125°C	-	3.1	-	V
<b>Dynamic Characteristics</b>						
C <sub>ies</sub>	Input Capacitance	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz	-	6000	-	pF
C <sub>oes</sub>	Output Capacitance		-	260	-	pF
C <sub>res</sub>	Reverse Transfer Capacitance		-	200	-	pF
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>CC</sub> = 600V, I <sub>C</sub> = 60A, R <sub>GE</sub> = 10Ω, V <sub>GE</sub> = 15V, Inductive Load, T <sub>C</sub> = 25°C	-	34	-	ns
t <sub>r</sub>	Rise Time		-	68	-	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	243	-	ns
t <sub>f</sub>	Fall Time		-	65	100	ns
Q <sub>g</sub>	Total Gate Charge		-	257	350	nC
Q <sub>ge</sub>	Gate to Emitter Charge		-	45	-	nC
Q <sub>gc</sub>	Gate to Collector Charge	-	95	-	nC	

### Electrical Characteristics of the Diode T<sub>C</sub> = 25°C unless otherwise noted

V <sub>FM</sub>	Diode Forward Voltage	I <sub>F</sub> = 15A	-	2.9	3.2	V
		I <sub>F</sub> = 60A	-	4.0	4.7	V
t <sub>rr</sub>	Diode Reverse Recovery Time	I <sub>F</sub> = 60A, di/dt = 100A/us	-	60	75	ns
I <sub>R</sub>	Instantaneous Reverse Current	V <sub>RRM</sub> = 1000V	-	-	2	μA

## Typical Performance Characteristics

Figure 1. Typical Output Characteristics

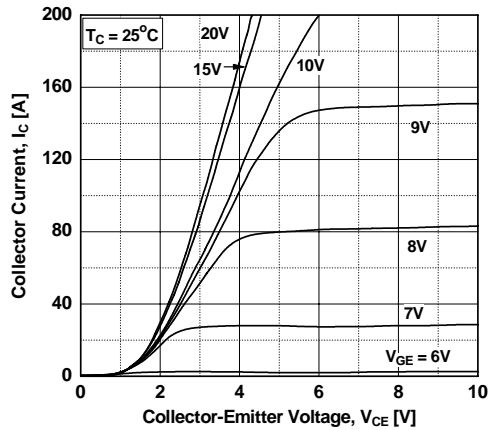


Figure 2. Typical Output Characteristics

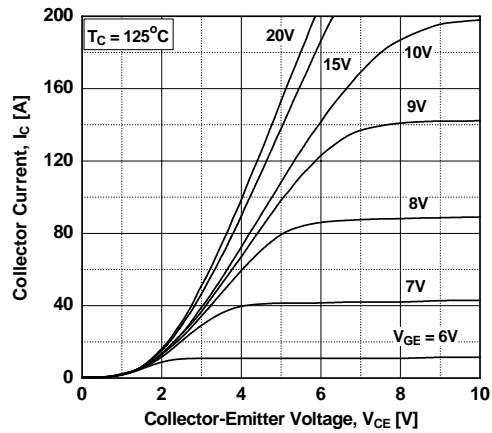


Figure 3. Typical Saturation Voltage Characteristics

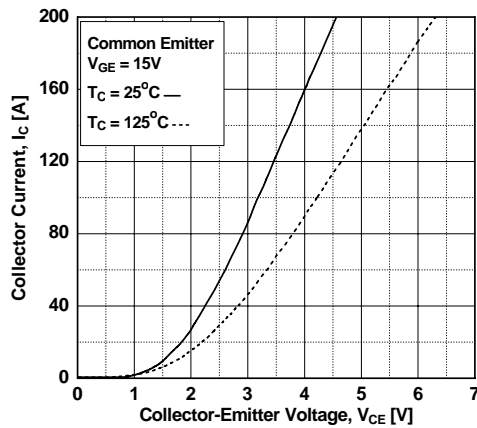


Figure 4. Transfer Characteristics

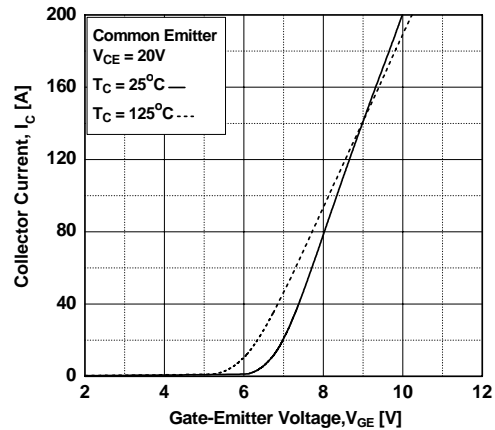


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

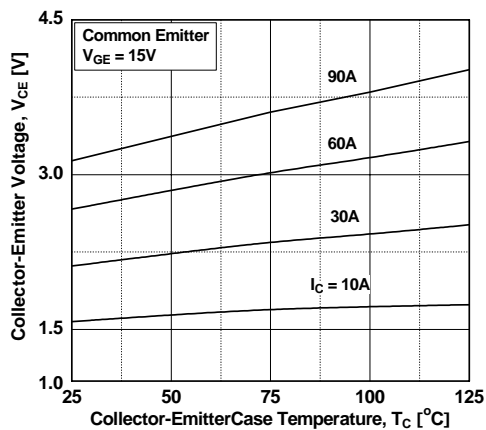
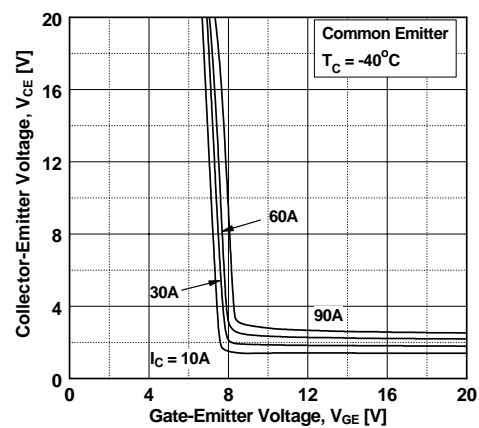


Figure 6. Saturation Voltage vs. Vge



## Typical Performance Characteristics

Figure 7. Saturation Voltage vs.  $V_{GE}$

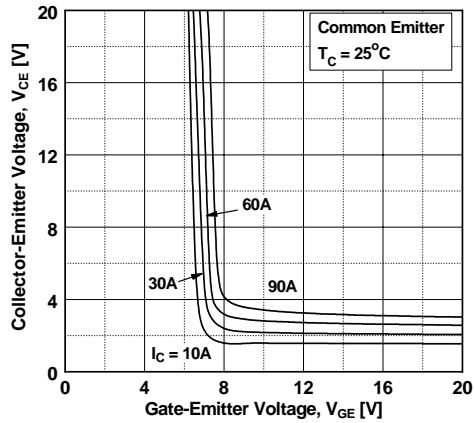


Figure 8. Saturation Voltage vs.  $V_{GE}$

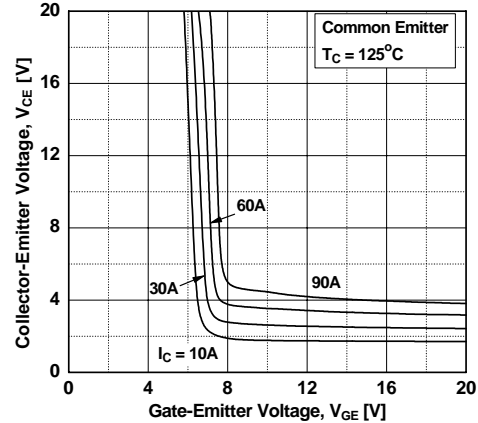


Figure 9. Capacitance Characteristics

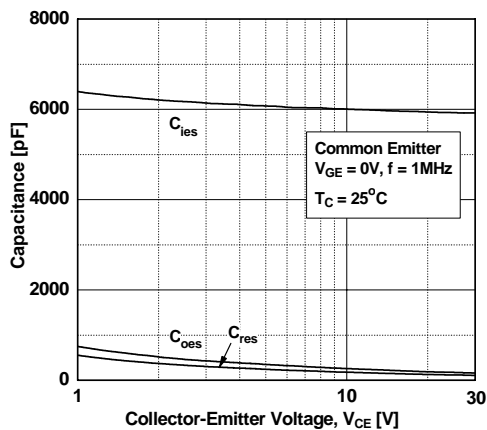


Figure 10. Gate charge Characteristics

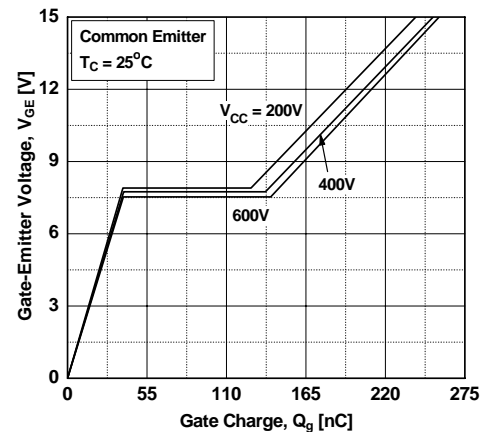


Figure 11. SOA Characteristics

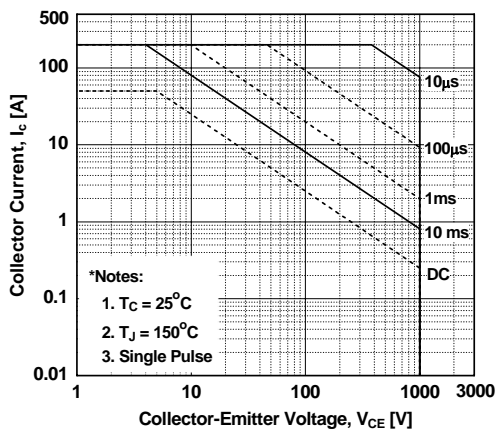
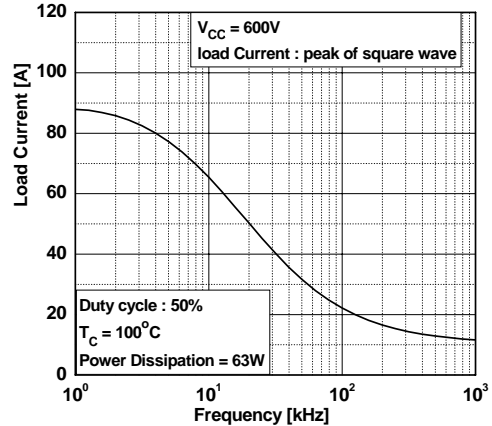
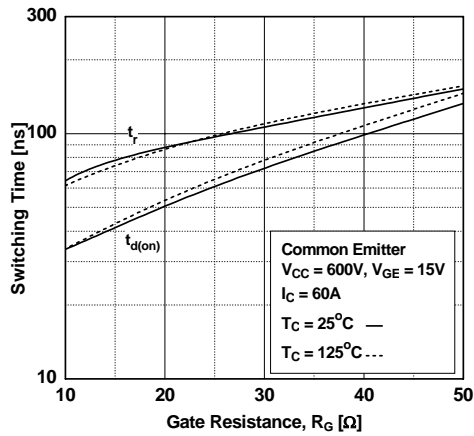


Figure 12. Load Current vs. Frequency

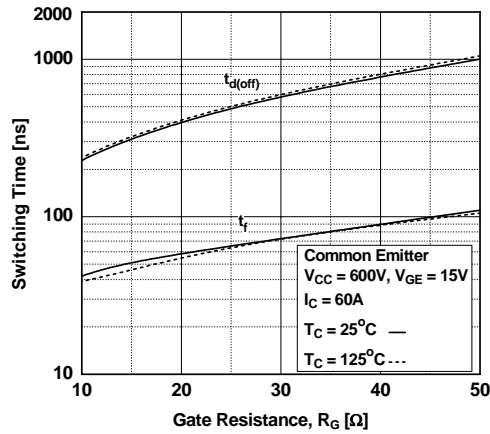


## Typical Performance Characteristics

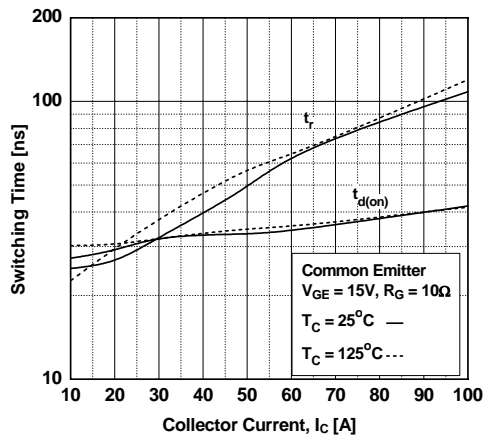
**Figure 13. Turn-on Characteristics vs. Gate Resistance**



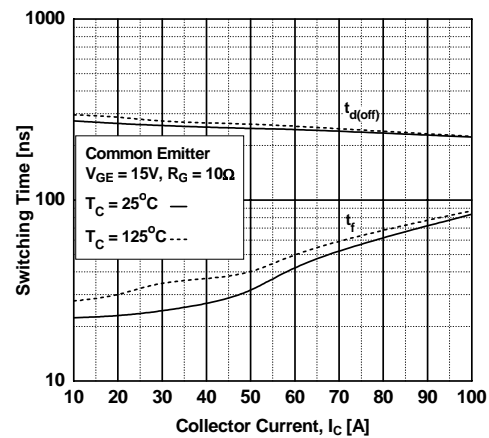
**Figure 14. Turn-off Characteristics vs. Gate Resistance**



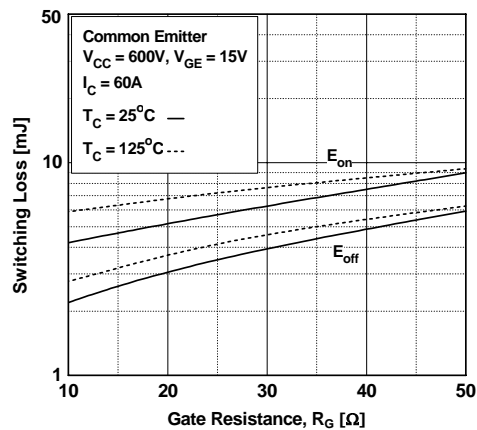
**Figure 15. Turn-on Characteristics vs. Collector Current**



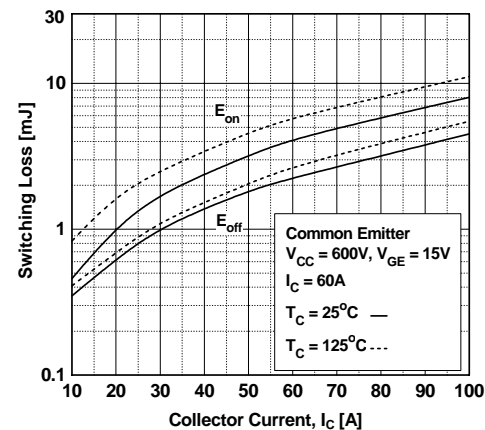
**Figure 16. Turn-off Characteristics vs. Collector Current**



**Figure 17. Switching Loss vs. Gate Resistance**



**Fig 18. Switching Loss vs. Collector Current**



## Typical Performance Characteristics

Figure 19. Turn off Switching SOA Characteristics

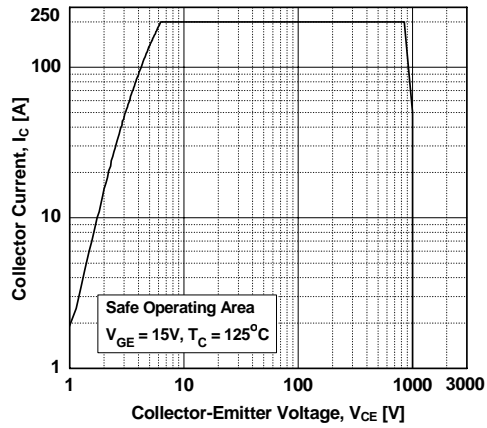


Figure 20. Forward Characteristics

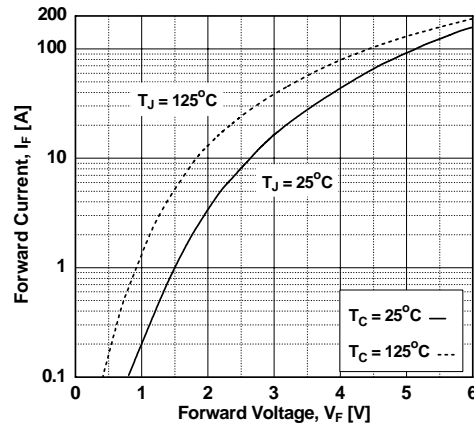


Figure 21. Reverse Current

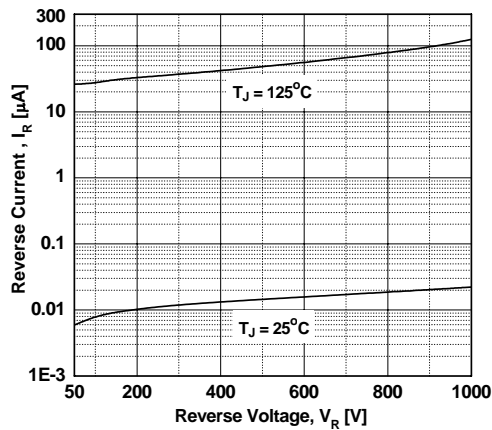


Figure 22. Reverse Recovery Characteristics vs. di/dt

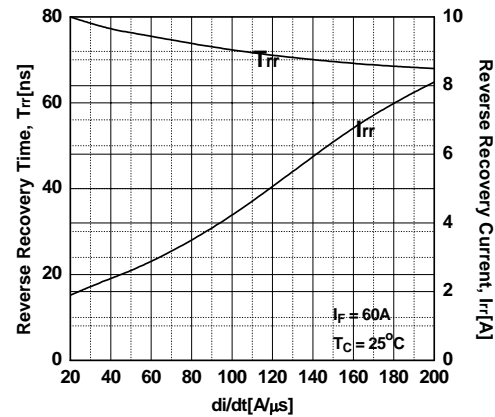
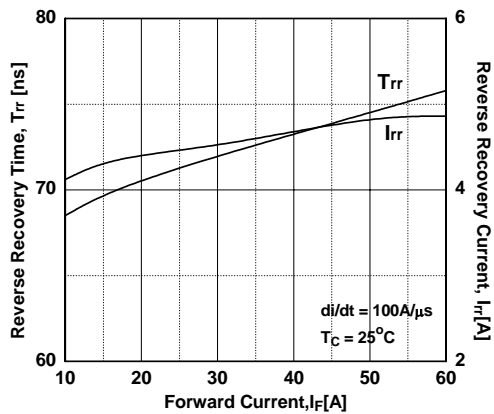
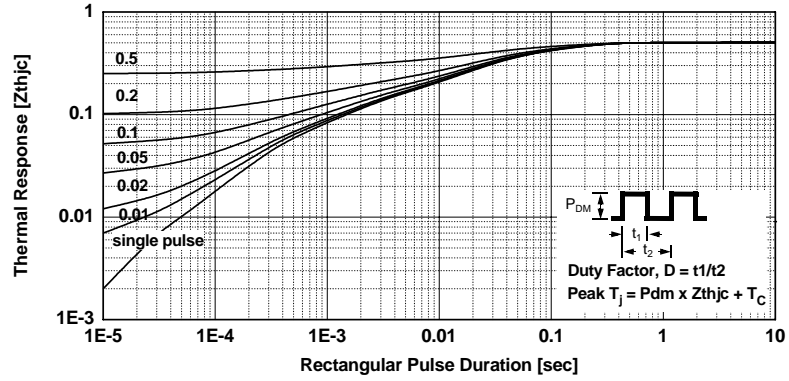


Figure 23. Reverse Recovery Characteristics vs. Forward Current



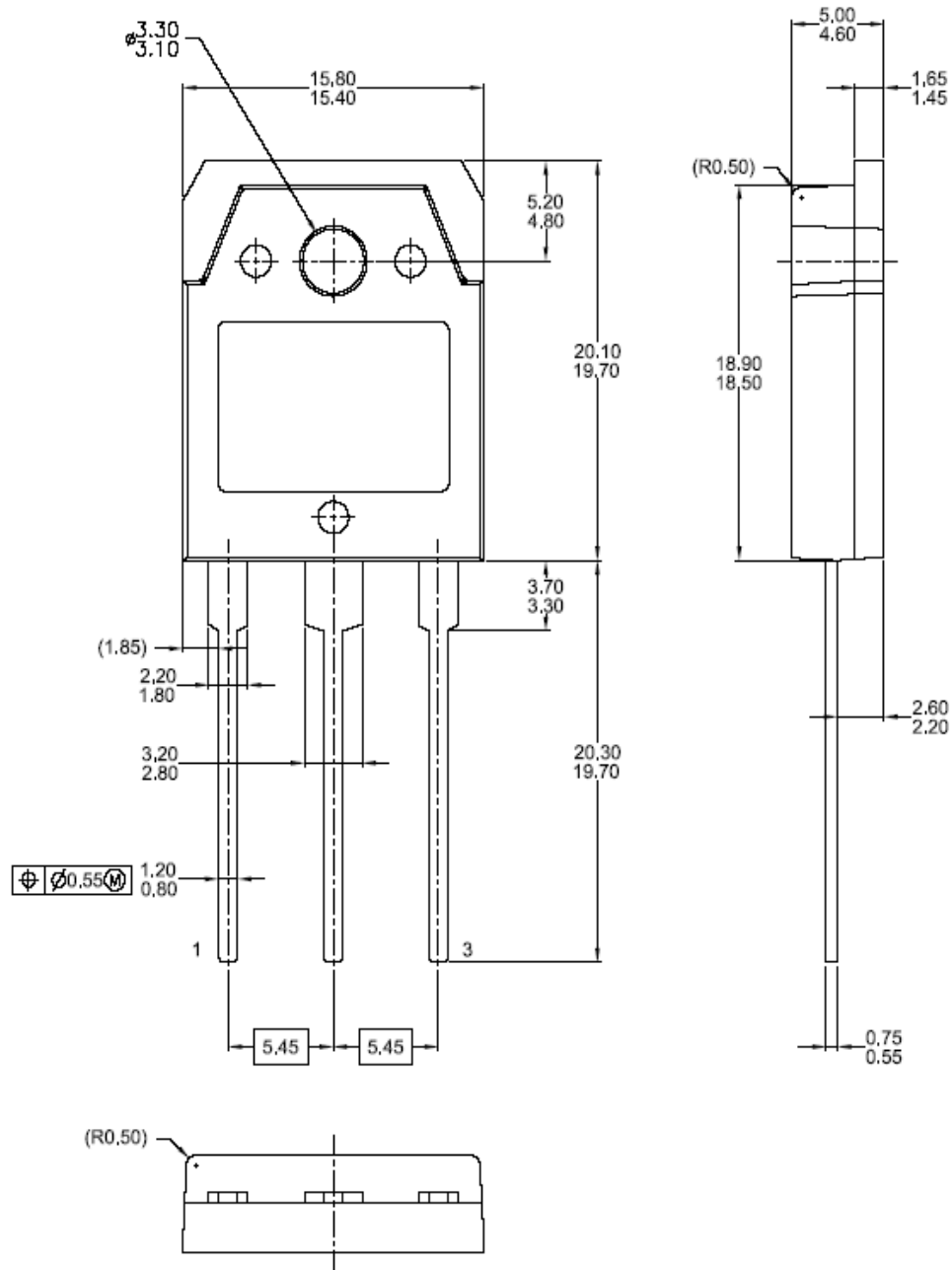
Typical Performance Characteristics

Figure 24. Transient Thermal Impedance of IGBT



Mechanical Dimensions

TO-3PN









FGA50N100BNTD2 1000V, 50A NPT-Trench IGBT CO-PAK





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